

BCH FORWARD ERROR CORRECTION DECODER

Andrew J. Thurston

ABSTRACT OF THE DISCLOSURE

An OC-192 front-end application-specific integrated circuit (ASIC) de-
interleaves an OC-192 signal to create four OC-48 signals, and decodes error-
correction codes embedded in each of the four OC-48 signals. The decoder generates
a Bose-Chaudhuri-Hocquenghem (BCH) error polynomial in no more than 12 clock
cycles. The decoder includes several Galois field multiply accumulators, and a state
machine which controls the Galois field units. In the specific embodiment wherein
the error-correction code is a BCH triple error-correcting code, four Galois field units
are used to carry out only six equations to solve the error polynomial. The Galois
field units are advantageously designed to complete a Galois field
multiply/accumulate operation in a single clock cycle. The Galois field units may
operate in multiply or addition pass-through modes. An error insertion circuit is also
provided for verifying correct operation of the BCH encoding and decoding circuits.
A desired number of errors may be programmed for insertion into the OC-48 data
signals. Error insertion may be performed in an iterative fashion to insert into
different data signals the desired number of errors, wherein the errors are placed
within the code words of the data signals at different location permutations for each
data signal. In one implementation, error verification is performed using an error
accumulator located in the receiver, and means are provided for examining an error
accumulator count of the error accumulator to see if the number of accumulated errors
matches with the number of inserted errors.